driven by Day is Shining-hair. All the sky and earth glisten with the light of his name. Jarnved, the great iron-wood forest lying to the east of Midgard, is the abode of a race of witches. One monster witch is the mother of many sons in the form of wolves, two of which are Skol and Hate. Skol is the wolf that would devour the maiden, Sun, and she daily flies from the maw of the terrible beast, and the moon-man flies from the wolf Hate.

The philosopher of Samos tells us that the earth is surrounded by hollow crystalline spheres set one within another, and all revolving at different rates from east to west about the earth, and that the sun is set in one of these spheres, and the moon in another.

The philosopher of civilisation tells us that the sun is an incandescent globe, one of the millions afloat in space. About this globe the planets revolve, and the sun and planets and moons were formed from nebulous matter by the gradual segregration of their particles, controlled by the laws of gravity, motion, and affinity. The sun, travelling by an appointed way across the heavens, with the never-ending succession of day and night, and the ever-recurring train of seasons, is one of the subjects of every philosophy. Among all peoples, in all times, there is an explanation of these phenomena, but in the lowest stage, away down in savagery, how few the facts discerned, how vague the discriminations made, how superficial the resemblances by which the phenomena are classified!

In this stage of culture, all the daily and monthly and yearly phenomena, which come as the direct result of the movements of the heavenly bodies, are interpreted as the doings of some one, some good acts. In civilisation, the philosopher presents us the science of astronomy, with all its accumulated facts of magnitude, and weights, and orbits, and distances, and velocities, with all the nice discriminations of absolute, relative, and apparent motions, and all these facts he is endeavouring to classify in homologic categories, and the evolutions and revolutions of the heavenly bodies are explained as an orderly succession of events.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Exactly 102 names are in the Cambridge Mathematical Tripos list this year (including three Ægrotant honours). The signification of this is not quite apparent, but lower in the list will be found two whose degree is allowed, but who are not to count it as an honour's degree. These men did well enough in the part of the examination they took to deserve a "poll," and not an honour's degree. Trinity has passed more than a score, St. John's 14, several colleges eight; but Jesus, Sidney, and Magdalene, as usual, have few mathematicians. Christ's has picked up well, having no fewer than ten in mathematical honours; Trinity Hall gets in only two, and Downing has one representative.

Prof. Humphry announces that his lectures on Anatomy and Physiology (the Muscular and Circulatory Systems) will be resumed on February 3, while his classes for the second M.B. and for the Natural Sciences Tripos recommence on Friday, February 6. Mr. Wherry (recently elected surgeon to Addenbrooke's Hospital) began a class in osteology on January 21, continuing on Mondays, Wednesdays, and Fridays at 1 P.M. Dr. Paget's lectures on the Principles and Practice of Physic begin on Monday, February 2.

SCIENTIFIC SERIALS

The Quarterly Journal of Microscopical Science, January.—H. M. Ward, on the embryo-sac and development of *Gymnadenia conopsea*, pl. 1-3.—Fred. Elfving, studies on the pollen bodies of the angio perms, pl. 4.—F. O. Bower, on the development of the conceptacle in the Fucaceæ, pl. 5.—Dr. Cunningham, on certain effects of starvation on vegetable and animal tissues.—J. E. Bloomfield, on the development of spermatozoa; part 1, Lumbricus, pl. 6, 7.—F. M. Balfour, on the spinal nerves of Amphioxus.—G. A. Hansen, the bacillus of leprosy, pl. 8.—Notes and Memoranda.—*Proceedings* of Dublin Microscopical Club, April, 1879, to October, 1879.

THE *American Naturalist*, vol. xiii. No. 12., December, 1879.—George H. Perkins, archæology of the Champlain Valley.—G. de Mortillet, the origin of the domestic animals.—F. Brendel, historical sketch of the science of botany in North America from 1635 to 1840.—E. D. Cope, on the extinct American rhinoceroses and their allies.—Recent Literature; General Notes; Scientific News.

Vol. 14, No. 1, January.—Henry J. Rice, observations on the habits, structure, and development of *Amphioxus lanceolatus*.—Elliot Coues, sketch of North American ornithology in 1879.—F. Brendel, historical sketch of the science of botany in North America from 1840 to 1858.—The Editor, notes on the present position of affairs in the Philadelphia Academy.—Recent Literature; General Notes; Scientific News.

Proceedings of the Academy of Natural Sciences, Philadelphia, 1879. Part 2, April to October.—Thos. Meehan, on hybrid fuchsias; on special fecundity in plants; do snakes swallow their young? on *Lonas inodora*; on sex in *Castanea americana*; Variations in *Thuja* and *Retinospora*.—Rev. H. C. M'Cook, the adoption of an ant-queen; mode of depositing ant-eggs; on the marriage fligh s of *Lasius flavus* and *Myrmica lobricornis*; pairing of *Linyphia marginata*; on mound-making ants; notes on *Tetramorium cæspitum*; on *Myrmecocystus mexicanus*.—John A. Ryder: on a new Pauropod and its larva (*Eurypauropus spinosus*); on a new Chirocephalus, *C. holmanii*; on honey glands on Catalpa leaves; description of *Streptocephalus sealii*, sp. nov.—Dr. Chapman, on Amphiuma; placenta of *Macacus cynomolgus*.—Dr. Dercum: the lateral sensory apparatus of fishes.—Dr. Leidy: on rhizopods in Sphagnum; fossil foot-tracks of the anthracite coal-measures; explosion of a diamond; on *Orgyia*; on some coast animals of New Jersey; on *Cristatella idæ*; on *Amœba blattæ*.—E. Potts: on the supposed sensitive characters of the glands of the Asclepiadaceæ.—E. Goldsmith, on amber containing fossil insects.—Angelo Heilprin, on some new eocene fossils from the Claiborne marine formation of Alabama, plate 13.

Revue des Sciences Naturelles, 2nd ser., tome 1, No. 3, December 15, 1879.—L. Tillier, contributions to a memoir on the geographical distribution of marine fish (conclusion).—A. de Saint-Simon, anatomical notes on some species of Pomatias.—Ph. Thomas, note on some species of horses found fossil in the neighbourhood of Constantine.—M. Leymerie, a sketch of the Pyrenees of the department of Aude.—Scientific Review, containing notices of French works on zoology, botany, and geology, published in 1879.—Bulletin.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, November 27, 1879.—"On certain Definite Integrals," No. 6. By W. H. L. Russell, F.R.S.

January 6.—"On certain Definite Integrals," No. 7. By W. H. L. Russell, F.R.S.

"On a Possible Mode of Detecting a Motion of the Solar System through the Luminiferous Ether." By the late Prof. J. Clerk Maxwell. In a letter to Mr. D. P. Todd, Director of the *Nautical Almanac* Office, Washington, U.S. Communicated by Prof. Stoke, Sec. R.S.

Mr. Todd has been so good as to communicate to me a copy of the subjoined letter, and has kindly permitted me to make any use of it.

As the notice referred to by Maxwell in the *Encyclopædia Britannica* is very brief, being confined to a single sentence, and as the subject is one of great interest, I have thought it best to communicate the letter to the Royal Society.

From the researches of Mr. Huggins on the radial component of the relative velocity of our sun and certain stars, the coefficient of the inequality which we might expect as not unlikely, would be only something comparable with half a second of time. This, no doubt, would be a very delicate matter to determine. Still, for anything we know *à priori* to the contrary, the motion might be very much greater than what would correspond to this; and the idea has a value of its own, irrespective of the possibility of actually making the determination.

In his letter to me Mr. Todd remarks, "I regard the communication as one of extraordinary importance, although (as you will notice if you have access to the reply which I made) it is likely to be a long time before we shall have tables of the satellites of Jupiter sufficiently accurate to put the matter to a practical test."

I have not thought it expedient to delay the publication of the letter on the chance that something bearing on the subject might be found among Maxwell's papers.

(Copy.)

Cavendish Laboratory,
Cambridge,
19th March, 1879

SIR,

I have received with much pleasure the tables of the satellites of Jupiter which you have been so kind as to send me, and I am encouraged by your interest in the Jovial system to ask you if you have made any special study of the apparent retardation of the eclipses as affected by the geocentric position of Jupiter.

I am told that observations of this kind have been somewhat put out of fashion by other methods of determining quantities related to the velocity of light, but they afford the *only* method, so far as I know, of getting any estimate of the direction and magnitude of the velocity of the sun with respect to the luminiferous medium. Even if we were sure of the theory of aberration, we can only get differences of position of stars, and in the terrestrial methods of determining the velocity of light, the light comes back along the same path again, so that the velocity of the earth with respect to the ether would alter the time of the double passage by a quantity depending on the square of the ratio of the earth's velocity to that of light, and this is quite too small to be observed.

But if J E is the distance of Jupiter from the earth, and l the geocentric longitude, and if l' is the longitude and λ the latitude of the direction in which the sun is moving through ether with velocity v, and if V is the velocity of light and t the time of transit from J to E,

$$J E = [V - v \cos \lambda \cos (l - l')]\, t.$$

By a comparison of the values of t when Jupiter is in different signs of the zodiac, it would be possible to determine l' and $v \cos \lambda$.

I do not see how to determine λ, unless we had a planet with an orbit very much inclined to the ecliptic. It may be noticed that whereas the determination of V, the velocity of light, by this method depends on the differences of J E, that is, on the diameter of the earth's orbit, the determination of $v \cos \lambda$ depends on J E itself, a much larger quantity.

But no method can be made available without good tables of the motion of the satellites, and as I am not an astronomer, I do not know whether, in comparing the observations with the tables of Damoiseau, any attempt has been made to consider the term in $v \cos \lambda$.

I have, therefore, taken the liberty of writing to you, as the matter is beyond the reach of any one who has not made a special study of the satellites.

In the article E [ether] in the ninth edition of the "Encyclopædia Britannica," I have collected all the facts I know about the relative motion of the ether and the bodies which move in it, and have shown that nothing can be inferred about this relative motion from any phenomena hitherto observed, except the eclipses, &c., of the satellites of a planet, the more distant the better.

If you know of any work done in this direction, either by yourself or others, I should esteem it a favour to be told of it.

Believe me,
Yours faithfully,
(Signed) J. CLERK MAXWELL

D. P. Todd, Esq.

Linnean Society, January 15.—Prof. Allman, president, in the chair.—Mr. A. J. Hewett exhibited and made remarks on a common web on community of cocoons, and of the moths (genus *Anaphe?*) escaped therefrom, said to have been got at Old Calabar.—Mr. Baker brought under notice a monstrous form of Thistle (*Carduus crispus*) obtained by the Rev. J. A. Preston in Wiltshire. In this specimen the capitula were abnormally numerous, and aggregated in secondary heads as in *Echinops*.—A Moa's tibia and tarsus (*Dinornis maximus*) dug up four feet from the surface at Omaru, N.Z., were shown on behalf of Mr. Jas. Forsyth.—A paper was read on the birds and mammals introduced into New Zealand, by Mr. H. M. Brewer. The author refers to Dr. Buller's Avifauna of New Zealand as not written too soon, for the rapid disappearance of many highly interesting forms is to be deplored. Finches and other small birds introduced are preyed on by the New Zealand Owl, but nevertheless quite a long list of British songsters, game birds, and others have been successfully established. Pheasants in some districts abound; and it is observed that when the tremor of an earthquake occurs the cock pheasants set up a continuous crow, either of defiance or fear (?). Partridges thrive best on the south island. Red deer are now seen in herds on the hills near Nelson. Hares have increased too rapidly, and the female in New Zealand has become more prolific, giving birth to six or seven young at a time. Kangaroos and various other mammals have likewise been imported, but unfortunately facts mentioned point out that the acclimatisation of some of them is not altogether an unmitigated blessing to the farmer colonist.—Then followed a memoir by Mr. J. G. Baker "Synopsis of the Aloineæ and Yuccoideæ." To these two tribes belong all the shrubby arborescent tribes of the capsular Liliaceæ. Aloes belong entirely to the Old World; out of a total of 200 species 170 being concentrated at the Cape of Good Hope, the remainder in the highlands of Tropical Africa. Of the Yuccoideæ there are about fifty species altogether, and nearly all are natives of Mexico and the Southern United States. The yuccas fruit rarely under cultivation, the large white pendulous flowers being in the wild plant fertilised by a moth of the genus *Pronuba*. *Herreria*, belonging to temperate South America, is a shrubby climber with the habit of *Smilax* and *Dioscorea*.—Messrs. J. Poland, J. Darell Stephens, and Prof. Allen Thomson were elected Fellows, and T. Jeffery Parker, an Associate of the Society.

Zoological Society, January 6.—Prof. Flower, F.R.S., president, in the chair.—Prof. Newton, F.R.S., V.P., exhibited, on behalf of Mr. G. B. Corbin, a specimen of *Acanthyllis* sive *Chætura caudacuta*—the Needle-tailed Swift—shot near Ringwood, in Hampshire, in July, 1879, remarking that it was the second example of this Siberian species which had been obtained in England.—Mr. John Henry Steel, F.Z.S., read a series of preliminary notes on the individual variations observed in the osteological and myological structure of the Domestic Ass (*Equus asinus*).—A communication was read from Mr. E. W. White, C.M.Z.S., containing notes on the distribution and habits of *Chlamyphorus truncatus*, from observations made by the author during a recent excursion into the western provinces of the Argentine Republic, undertaken for the purpose of obtaining a better knowledge of this animal.—Dr. John Mulvany, R.N., read a paper on a case which seemed to him to indicate the moulting of the horny beak in a Penguin of the genus *Eudyptes*.—Mr. O. Thomas, F.Z.S., read the description of a new species of *Mus*, obtained from the Island of Ovalau, Fiji, by Baron A. von Hügel, and proposed to be called *Mus huegeli*, after its discoverer.—A communication was read from Mr. R. G. Wardlaw Ramsay, F.Z.S., containing a report on a collection of birds made by Mr. Bock, a naturalist employed by the late Lord Tweeddale, in the neighbourhood of Padang. Three species were described as new, and proposed to be called *Dicrurus sumatranus*, *Turdinus marmoratus*, and *Myiophoneus castaneus*.—Dr. Günther, F.R.S., read a description of two new species of Antelopes, of the genus *Neotragus*, *N. kirki*, from Eastern Africa, and *N. molaris*, from Damara-land.

GENEVA

Society of Physics and Natural History, May 1, 1879.—M. Charles Soret details his experiments for investigating the mode of distribution of salts in solutions, the constituents of which are subjected to different temperatures. The attempts made upon azotate of potash and chloride of sodium led him to the discovery that there is a greater concentration in the cold part than in the warm.

June 5.—Prof. Schiff discusses the comparative properties of the nerves of sense and those of motion. He demonstrates on a curarised frog, the persistence of sensibility after the a imal has lost all capacity for movement under the action of the poison. He observes, at the same time, that the persistence is only relative, and that the sensibility presently disappears, after an interval varying in duration according to the temperature. If that temperature is low (3° or 4° C., for example) the frog may live for eighteen days.—MM. L. Soret and E. Sarasin have determined the principal elements of the magnesium spectrum, by measuring the refraction indices of quartz for its principal lines, and by the existence of numerous photographs.—M. G. Lunel describes a new species of Trygonide belonging to the genus Pteroplatea, brought from Rio Janeiro.—M. R. Pictet reports his investigations to solve the problem—What form must be given to a definite surface that it may maintain its equilibrium in the air with the minimum of mechanical work? His experiments were made with kites having a dynamometer of great

sensibility attached to their strings. His conclusion was that, with reference to the work done, a given surface would the more easily support a fixed weight in proportion as the surface presented its shorter dimension in the direction of the wind, and its longer dimension perpendicularly to that direction.—M. A. De Candolle announces the publication of the last part of the fourth volume of M. Boissier's "Flora Orientalis," completing the description of Dicotyledons.

July 8.—MM. Micheli gives an abstract of his monographic investigations of the families Alismaceæ, Butomaceæ, and Juncagineæ.—M. E. Ador has studied with MM. Friedel and Crafts the action of chloride of methyl on benzine, in presence of chloride of aluminium.—M. Forel has detected in the oscillalations of the surface of Lake Geneva a movement which he terms "seiches dicrotes," consisting in a redoubling of the oscillation in two series of oscillations which mutually interfere, being of unequal duration.—Prof. Colladon observed an upward current of air round the Pissevache Waterfall, which is surrounded by a layer from 30 to 40 cm. in thickness, filled with very small drops of water. This phenomenon, due to the air-suction of the fall, might serve to explain the atmospheric currents accompanying the formation of hail.

August 7 —Prof. Schiff relates his researches on the action exercised upon hysterical subjects by the contact of metals and electric currents.—M. R. Pictet saw on Mount Jura, during a storm that broke forth on the 5th, a bluish light produced over a forest, resembling St. Elmo's fire. It disappeared and reappeared three times, under the influence of successive violent thunder-claps.

September 4.—M. Soret believes the "seiches dicrotes" observed by M. Forel can be explained by the superposition of two oscillations, one "uninodal," lasting seventy-two minutes, the other "binodal," lasting a little less than half that time.

October 2.—Dr. Marcet shows his instruments for collecting and analysing the air emitted from the lungs.—M. C. de Candolle has ascertained the prolonged action of low temperatures on the germinative power of various kinds of grain.

November 6.—MM. L. Soret and Rilliet have investigated the absorption of the ultra-violet rays of the spectrum by certain organic substances—the azotates of ethyl, isobutyle, and amyl, ammonia, &c.—M. R. Pictet presents a barometer intended to measure vapour tensions. It is composed of a vertical glass tube, wide at the top and very narrow towards the bottom, which bends at a right angle to be prolonged into a long horizontal tube. The lower level of the mercury is therefore constant, and as its volume does not vary, the variations of the higher level in the large tube are reproduced on a much enlarged scale in the narrow horizontal tube from which the readings are taken.—From a comparison of a series of eighty years' meteorological observations made at Geneva, Prof. Wartman has observed that the odds are remarkable in favour of August 15 being a stormy day.—Prof. Brun shows a fragment of fulgurite found on Mount Jura in chalky soil, a circumstance of very rare occurrence. Its surface is covered with small vitrefied globules which can only be explained by the fusion of the chalky matter under the influence of the lightning.

PARIS

Academy of Sciences, January 19.—M. Edm. Becquerel in the chair.—M. Daubrée presented the fifth volume of his "Traité de Méchanique."—The following papers were read:—On some applications of elliptic functions, by M. Hermite.—On the heat of formation of hydrate of chloral, by M. Berthelot. He offers experimental proof that gaseous chloral and water-vapour combine together with liberation of heat, and without change of state. The two are introduced from the boiling liquids into a small glass globe (with thermometer and drawing-off tube), one through a straight, the other (chloral vapour) through a spiral tube, and these parts are inclosed in a stoppered piece of glass tube, through which a steam current from the same source as the other circulates, and which also holds a thermometer. Throughout the experiment, after the vapours met, the thermometer in the globe showed a higher temperature than that of the inclosure, and the temperature was about 1° above that of boiling water, during twenty-five minutes. Negative results may be got, if the relative proportions be not regulated.—Note on hydrate of chloral, by M. Wurtz. With similar conditions of experiment, and the chloral previously boiled to expel hydrochloric acid, he had not found the least rise of temperature.—Note on the utility of concentric curved plates to alternately charge siphons by means of an oscillating liquid column, by M. De Caligny.—Simplification of American audiphone apparatus for the deaf and dumb, by M. Colladon. A simple disk of a particular kind of pasteboard, which is compact, homogeneous, elastic, and tenacious, is substituted for the hardened caoutchouc, no cords being required to fix the tension. The part applied to the teeth is coated with a substance to resist moisture. Musical sounds, and words uttered near, were understood by deaf mutes who tried the instrument.—The General Inspector of Navigation communicated figures regarding the daily height of the Seine in 1879, at the Pont Royal and the Pont de la Tournelle. The highest water at the former was 6·21 m. on January 9, the lowest 1·67 m. on October 10, 15, and 17; the mean, 2·72 m.—A letter was read, suggesting to saw into pieces the bank of ice on the Loire, near Saumur. Admiral Paris gave details of an attempt made in Russia in 1855 to liberate ships from ice by means of saws. He thought the method very useful where there is a current to carry off the ice; the ice being sawn in long strips across the current, which break up *en route*.—On a class of linear differential equations, by M. Picard.—Experimental and clinical researches on anæsthesia produced by lesions of the cerebral convolutions, by M. Tripier. Sensibility may be more or less diminished by lesions of the fronto-parietal region, which has been thought only a motor zone.—On the plants which serve as base for various curares, by M. Planchon. Four distinct regions are centres of preparation for curare, and for each a principal plant can be indicated. (The regions are English and Upper French Guiana, that of the Upper Amazon, and that of the Rio Negro.)—On the linear and lacunar confluents of the connective tissue of the cornea, by M. Renaut.—On the parturition of the common porpoise (*Phocæna communis*), by M. Jourdain.—Influence of climates on the maturation of corn, by M. Balland. This relates to observations at Orleansville, in Algeria. The mean monthly temperatures in 1877–78–79 are given; they range from 7°·8 to 32°·6. It is calculated that wheat, to reach its full evolution, must have received 2498° of heat in 1877-78, and 2432° in 1878-79, which is near the number (2365°) obtained by M. Hervé Mangon for Normandy; but the time required at Orleansville was 180 days, as against 266 in the other case.—Remarks on the use of Smithson's pile for detection of mercury, especially in mineral waters, by M. Lefort. Arsenic may, with it, be confounded with mercury. The easy reduction of oxygenated acids of arsenic by metals, under influence of the weakest electric current, is made evident.—Light, cover, and humus, studied in their influence on the vegetation of trees in forests, by M. Gurnaud.

CONTENTS